

**DRAINAGE ANALYSIS  
&  
SEDIMENT AND EROSION  
CONTROL PLAN**  
Prepared for:  
**ASSOCIATED BUYERS  
OWNER  
STEPPING STONE FARM PARTNERSHIP**

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USGS Quadrangle Location Map  
NH GRANIT GIS Information Map

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### **Appendix IA Existing Conditions Analysis**

2 Yr- 24 Hr Summary  
10 Yr – 24 Hr. Summary  
25 Yr. 24 Hr. Complete  
50 Yr – 24 Hr Summary  
100 Yr – 24 Hr. Summary

### **Appendix II Proposed Conditions Analysis**

2 Yr- 24 Hr Summary  
10 Yr – 24 Hr Summary  
25 Yr. – 24 Hr. Complete  
50 Yr. 24 Hr. Summary  
100 Yr. 24 Hr. Summary

### **Appendix III Calculations, Charts, & Graphs**

Enclosed:	Sheet W1 -	Existing Conditions Watershed Plan
	Sheet W2 -	Proposed Conditions Watershed Plan

## **DESIGN METHOD OBJECTIVES**

Associated Buyers is proposing to construct an external freezer to the North Side of the existing building on Commerce Way. This building has shifted East since the original proposal. The proposed building size is 7,250 Sq.Ft. An Existing and Proposed Conditions analysis was conducted for the purpose of estimating the peak rate of stormwater run-off and to subsequently design adequate mitigation of drainage. Designing two watershed models we have compared the differences in these rates of peak run-off. Sheet W1 outlines the characteristics of the site in its existing or pre-construction conditions. The second analysis displays the proposed (post-construction) conditions (See Sheet W2). The analysis was conducted using data for; 2 Yr – 24 Hr (3.0”), 10 Yr – 24 Hr (4.3”), 25 Yr -24 Hr (5.1”), 50 Yr – 24 Hr (5.6”) and 100 Yr. – 24 Hr (6.3”) storm events. Storm event analysis was accomplished using the USDA SCS TR-20 method within the HydroCAD Stormwater Modeling System environment.

### **1.0 Existing Analysis:**

Reference: Sheet W1 - Existing Conditions Watershed Plan (Enclosed)  
Existing Conditions Plans

The existing property is primarily covered by impervious surface. Areas that are not covered contain wetlands and woodlands. There is a small area to the North side of the building, in the location of the proposed freezer which is not wooded, and contains unmaintained grass.

#### **Subcatchment #1:**

Subcatchment number one consist of mostly developed property. It includes part of the building's roof line, much of the entrance pavement area, all of the gravel parking area, and the undeveloped land to the boundary line. The Northerly boundary line is the point of analysis and it is a Non-Point discharge. (The CFS analysis is along the entire line and not a single discharge) However, it should be noted that shortly after the boundary line analysis point the storm water quickly channelizes into the abutting wetland.

The time of concentration for this Subcatchment area starts at the entrance with sheet flow over the pavement, shallow concentrated flow over the gravel parking area, with the final leg being shallow concentrated over a woodland area.

At the loading dock area there is an existing catch basin with an extremely shallow invert. The existing pipe is a 6” HDPE N-12 pipe wich simply discharges to the woods. This devise is updated in the proposed condition.

### **2.0 Proposed Analysis:**

Reference: Sheet W2 - Proposed Conditions Watershed Plan (Enclosed)  
Sheet W2 – Proposed Conditions Watershed Detail Plan  
Proposed Site Plan  
Proposed Site Detail Plans

#### **Final Reach #100:**

Existing Subcatchment #1 was split into three separate areas. The first is the remaining area of the original Subcatchment with the new addition added. As per the prior review letter an erosion lining was added to the rear of both of the buildings.

Proposed Subcatchment #3 was added to capture much of the sites impervious run off in a treatment device designed as a rain garden. This device also acts to reduce peak rates at the

final discharge point #100. The Rain Garden is designed with 18" of bio media and is sized for the WQV.

Proposed Subcatchment #2 was added due to some grading within the parking lot. This area drains to the existing basin. The proposal is to upgrade this basin with an ADS yard drain, and upgrade the outlet pipe to remove icing problems. A 4' sump is being added to this structure to provide a level of treatment which does not exist in the existing condition.

### **3.0 FULL COMPARATIVE ANALYSIS**

#### **Peak Rate of Discharge**

<u>ANALYSIS</u> <u>in Acre- Feet</u>	<u>COMPONENT</u>	<u>PEAK RATE DISCHARGE (Cubic Feet / Second) (Volume</u>				
		2 Yr	10 Yr	25 Yr	50 Yr.	100 Yr
Final Reach #100	Existing	4.02	6.98	8.85	10.02	11.67
	Proposed	3.07	5.38	7.99	9.42	11.20

#### **Treatment:**

Treatment off the parking area is routed through the proposed Rain Garden. The roof runoff is proposed to be clean due to no mechanical systems being constructed. The basin which had no treatment in the existing condition now has pretreatment.

#### 4.0 SEDIMENT & EROSION CONTROL PLANS BEST MANAGEMENT PRACTICES (BMP's)

Reference: Sheet W2 - Proposed Conditions Plan  
Proposed Site Plans  
Erosion & Sediment Control Details

The proposed site development is protected from erosion and the roadways and abutting properties are protected from sediment by the use of Best Management Practices as outlined in the New Hampshire Stormwater Manual, Volume 2, Post-Construction Best Management Practices Selection & Design (December 2008, NHDES & US EPA). Any area disturbed by construction will be re-stabilized within 30 days and abutting properties and wetlands will not be adversely affected by this development. All swales and drainage structures will be constructed and stabilized prior to having run-off directed to them. Reference is also made to the Stormwater System Operation and Maintenance Plan / Inspection & Maintenance Manual which has been written specifically for this project and available to the owner.

#### **Silt Fence**

The plan set demonstrates the location of silt fence for sediment control. The Erosion and Sediment Control Details, has the specifications for installation and maintenance of the silt fence.

#### **Drainage Swales / Stormwater Conveyance Channels**

Drainage swales will be stabilized with vegetation for long term cover as outlined below, and on Sheet E-102 using seed mixture C. As a general rule, velocities in the swale should not exceed 3.0 feet per second for a vegetated swale although velocities as high as 4.5 FPS are allowed under certain soil conditions.

#### **Vegetated Stabilization**

All areas that are disturbed during construction will be stabilized with vegetated material within 30 days of breaking ground. Construction will be managed in such a manner that erosion is prevented and that no abutter's property will be subjected to any siltation, unless otherwise permitted. All areas to be planted with grass for long-term cover will follow the specification and on Sheet E-102 using seeding mixture C, as follows:

Mixture	Pounds per Acre	Pounds per 1,000 Sq. Ft.
Tall Fescue	24	0.55
Creeping Red Fescue	24	0.55
Total	48	1.10

### **Stabilized Construction Entrance**

A temporary gravel construction entrance provides an area where mud can be dislodged from tires before the vehicle leaves the construction site to reduce the amount of mud and sediment transported onto paved municipal and state roads. The stone size for the pad should be between 1 and 2-inch coarse aggregate, and the pad itself constructed to a minimum length of 50' for the full width of the access road. The aggregate should be placed at least six inches thick. A plan view and profile are shown on Sheet E-102- Sediment and Erosion Control Detail Plan.

### **Environmental Dust Control**

Dust will be controlled on the site by the use of multiple Best Management Practices. Mulching and temporary seeding will be the first line of protection to be utilized where problems occur. If dust problems are not solved by these applications, the use of water and calcium chloride can be applied. Calcium chloride will be applied at a rate that will keep the surface moist but not cause pollution.

### **Filter Strips**

Filter strips are areas of land with natural or planted vegetation designed to receive sheet run-off from up gradient development. These natural areas, preferably wooded, are effective in removing sediment and sediment-laden pollutants from such run-off, although their effectiveness is severely diminished when forced to deal with concentrated flow and must therefore be equipped with a level-spreading device. Filter strips should not have a slope exceeding fifteen percent and have a minimum length of seventy-five feet.

### **Drainage Swales / Stormwater Conveyance Channels**

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### **Deep Sump Catch Basin**

Deep Sump Catch Basins are used throughout the site as a pretreatment measure to remove sediment and debris from storm water runoff. Each catch basin used as a pretreatment device prior to a subsequent BMP (Best Management Practice) will be designed and installed "off-line" and not installed in series. Deep Sump Catch Basins will be designed with a sump that is four times the depth of the discharge culvert and a minimum of four feet. All pretreatment deep sump catch basins will have an outlet pipe hood which extends one-foot below the outlet invert and will include a hood vent. Sediment must be removed from Deep Sump Catch Basins on a regular basis, at least twice a year and more often if the sumps become half-full. Inspections should be conducted periodically. See Sheet D-102 for details.

### **Sediment Forebays**

The Sediment Forebay is designed to dissipate energy from storm water run-off and provide settling for coarse sediments. The Sediment Forebay is constructed of a riprap plunge pool and check dam where the storm water drainage system enters the detention basin. The forebay is 2 feet deep with 3:1 sideslopes. The Sediment Forebay is designed to remove sediment from storm water run-off and therefore is going to require inspection and maintenance periodically. It will be inspected semi-annually and maintained when required but at a minimum annually. A sediment gage will be provided and sediment will be removed when the storage area is half-full. The banks will require mowing.

### **Outlet Protection**

Outlet Protection consists of a riprap apron or preformed scour hole that is designed to provide velocity reduction of the surface water run-off that is leaving a culvert. The design is dependent on the culvert size, soil conditions, velocity, and quantity of the run-off. There are to be no bend or curves at the intersection of the conduit and apron. See sheet D-102 for details.

### **Treatment Swales**

The Treatment Swale is designed to be wide and very flat to reduce the velocity of run-off to promote sedimentation and pollutant removal. Prior to having run-off directed to a treatment swale, the vegetation must be 85% stabilized. The bottom of a treatment swale is intended to be above the Seasonal High Water Table (SHWT). A treatment swale is specifically designed to meet residence time for anticipated flows that are generated on a developed site.

### **Vegetated Filter Strips**

The Vegetated Filter Strip is a natural sloping area at the terminus of the drainage treatment chain. The natural vegetation will remain in place undisturbed and unmaintained. The slope will be less than 15% and not interrupted by any site features.

### **Construction Sequence**

1. Cut and remove trees in construction areas as directed or required.
2. Install Silt Fence and construct and/or install temporary and permanent sediment erosion and detention control facilities (Vegetated swales, level spreaders, and constructed filter strips), as required. Erosion, sediment and facilities shall be installed and stabilized prior to any earth moving operation, and prior to directing run-off to them.
3. Clear, grub, and dispose of debris in approved facilities.
4. Excavate and stockpile topsoil / loam. All disturbed areas shall be stabilized immediately after grading.
5. Construct the roadway and its associated drainage structures.
6. Begin permanent and temporary seeding and mulching. All cut and fill slopes and disturbed areas shall be seeded and mulched as required, or directed.
7. Daily, or as required, construct temporary berms, drainage ditches, sediment traps, etc. to prevent erosion on the site and prevent any siltation of abutting waters or property.
8. Inspect and maintain all erosion and sediment control measures during construction.
9. Complete permanent seeding and landscaping.
10. Remove temporary erosion control measures after seeding areas have established themselves and site improvements are complete. Smooth and re-vegetate all disturbed areas.
11. All swales and drainage structures will be constructed and stabilized prior to having run-off being directed to them.
12. Finish graveling all roadways/parking.

### **Temporary Erosion Control Measures**

1. The smallest practical area of land shall be exposed at any one time.
2. Erosion, sediment control measures shall be installed as shown on the plans and at locations as required, or directed by the engineer.
3. All disturbed areas shall be returned to original grades and elevations. Disturbed areas shall be loamed with a minimum of 4" of loam and seeded with not less than 1.10 pound of seed per 1,000 square feet (48 pounds per acre) of area.



4. Silt fences and other barriers shall be inspected periodically and after every rainstorm during the life of the project. All damaged areas shall be repaired, sediment deposits shall periodically be removed and properly disposed of.
5. After all disturbed areas have been stabilized, the temporary erosion control measures are to be removed and the area disturbed by the removal smoothed and re-vegetated.
6. Areas must be seeded and mulched within 5 days of final grading, permanently stabilized within 15 days of final grading, or temporarily stabilized within 30 days of initial disturbance of soil.

### **Inspection and Maintenance Schedule**

Fencing will be inspected during and after storm events to ensure that the fence still has integrity and is not allowing sediment to pass. Sediment build-up in swales and level spreaders will be removed if it is deeper than six inches. See also Stormwater System Operation & Maintenance Plan and Inspection & Maintenance Manual published separately also by Berry Surveying & Engineering.

### **5.0 CONCLUSION**

This proposed site development off Commerce Way reduces peak rates at all storm events,

A Site Specific, Terrain Alteration Permit (RSA 485: A-17) is NOT required for this site plan due to the area of disturbance being less than 100,000 square feet.

Respectfully Submitted,

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